

## Claims

1. A base station for communicating signals between an operator and one or more mobile units by means of an antenna system having a plurality of radiating elements, wherein:

the system is arranged to process the signals as a plurality of component signals, each component signal being associated with one or more radiating elements within the antenna system, and

- modulating means are arranged to apply complex weights to the component signals such that summation of the component signals results in the production of an antenna beam direction dependent on the value of the complex weights, and

- wherein splitting, combining, and component signal amplifying means is provided between the application of the complex weight to the component signal and the component signal passing through its associated radiating element or elements, characterised in that:

- the splitting and combining means incorporates an interface allowing other operators to be connected simultaneously to the same antenna system, with each operator operating on a different frequency, and the system further includes a measurement receiver, and a data hub, wherein the measurement receiver is adapted to take a complex measurement from any component signals in the vicinity of the antenna system and generated by any basestation connected to the antenna system, and to pass the measurement to the generating basestation via the data hub, to enable phase component signal phase correction due to changes in feeder length between the basestation and the antenna.

2. A base station as claimed in claim 1 wherein the measurement receiver is arranged to be switchable between different component signals in the vicinity of the antenna system.

3. A base station as claimed in claim 1 or claim 2 arranged to apply the complex weights to the component signals at a component signal frequency lower than the component signal frequency that is passed to the antenna.
- 5 4. A base station as claimed in any of claims 1 to 3 wherein the base station is arranged to apply the complex weights to the component signals at a component signal frequency substantially the same as the component signal frequency that is passed to the antenna.
- 10 5. A base station as claimed in any of claims 1 to 4 wherein the modulating means comprises vector controllers.
6. A base station as claimed in claim 5 wherein the vector controllers are arranged to control the relative phase of each component signal.
- 15 7. A base station as claimed in claim 5 or claim 6 wherein the vector controllers are arranged to control the amplitude of the component signal.
8. A plurality of basestations connected to a single antenna system,  
20 wherein each basestation is a basestation as claimed in claim 1.
9. A method of controlling the direction of a transmit beam produced by an antenna connected to at least two base stations, the method comprising:  
in a first base station, splitting a first signal to be transmitted into a  
25 plurality of component signals;  
applying a complex weight or weights to at least one of the component signals, thereby changing the phase and/or amplitude of the component signal relative to at least one other of the component signals;  
passing the component signals to amplifying and combining means  
30 wherein the signals are brought to a power level suitable for transmission, and combining the component signals with component signals from a second base station using combining and filtering means;

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passing the combined component signals to antenna elements or groups of elements, such that transmission by the elements causes a beam of energy representative of the first signal to be formed in a direction governed by the complex weight or weights;

5           measuring at least one of said component signals in the vicinity of the antenna using a measuring receiver, and passing information relating to the measurement through a data hub to the basestation.

10          10.     A method as claimed in claim 9 wherein the signals generated by the second base station are independent from those generated by the first base station.

11.     A method of controlling the direction of a receive beam produced by an antenna connected to at least two base stations, the method comprising:

15           i) receiving in the antenna a plurality of component signals, each relating to a receiving element or group of receiving elements, and passing the signals to splitting and filter means via a plurality of feeder cables;

          ii) separating using the splitting and filter means the component signals intended for a first base station, and amplifying said component signals using  
20     amplification means;

          iii) applying a complex weight or weights to at least one of the component signals in the first base station, thereby changing the phase and/or amplitude of the component signal relative to at least one other of the component signals;

25           iv) combining the component signals in a beamformer in the first base station to produce a receive beam formed in a direction governed by the complex weight or weights;

          v) feeding a signal from a signal generator to one or more feeder cables in the vicinity of the antenna, and measuring the properties of the  
30     received signal at the basestation;

          vi) repeating steps ii to v in a second basestation independently of the first base station.